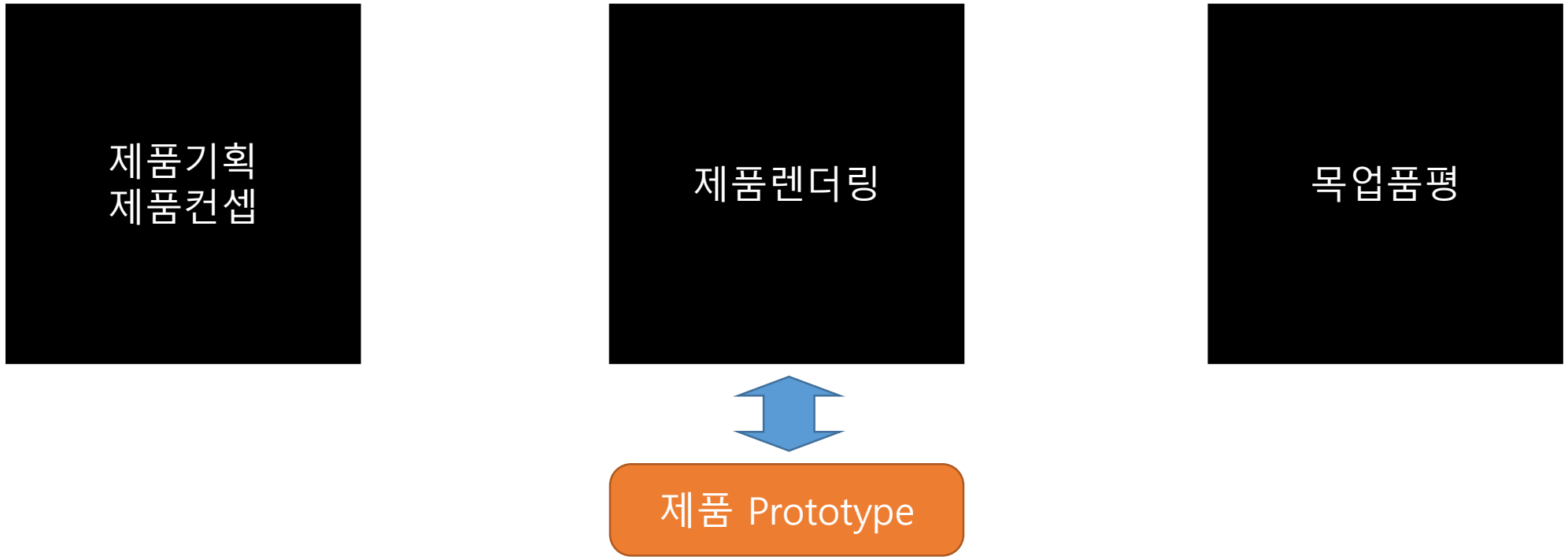
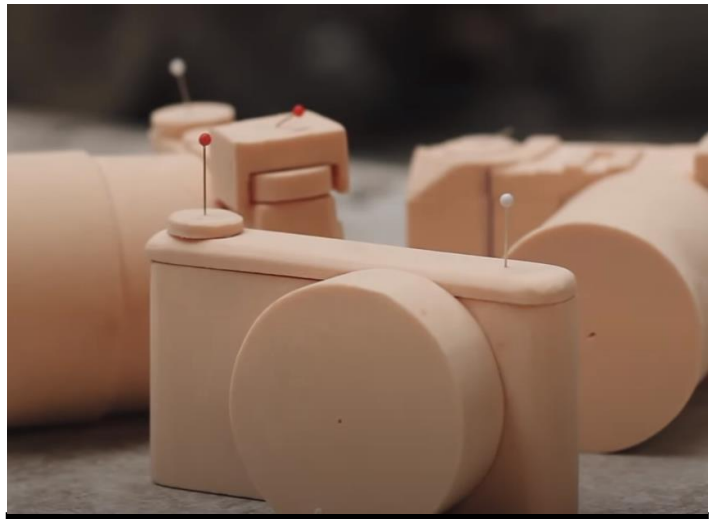
Design Prototyping with 3D printer

제품 디자이너가 현업에서 과제 수행을 위해 꼭 필요한 절차?



제품 Prototype을 현업에선 어떻게 만들까?

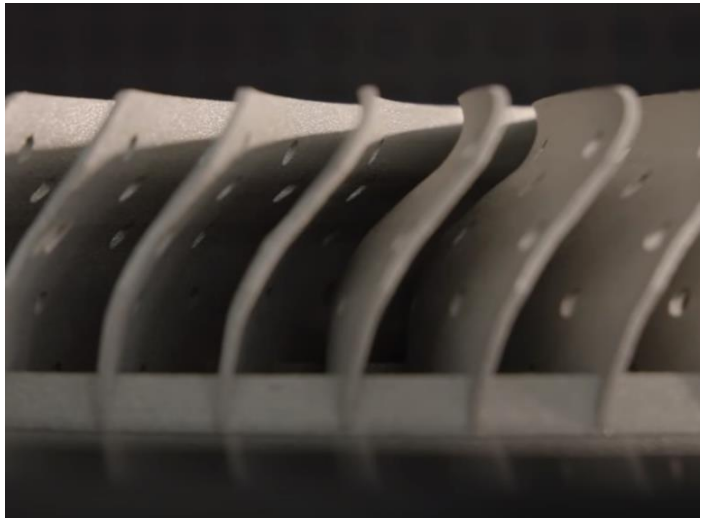


워크샵에서 직접
우드락 / Foam 모델링

Desk Top
3D 프린터

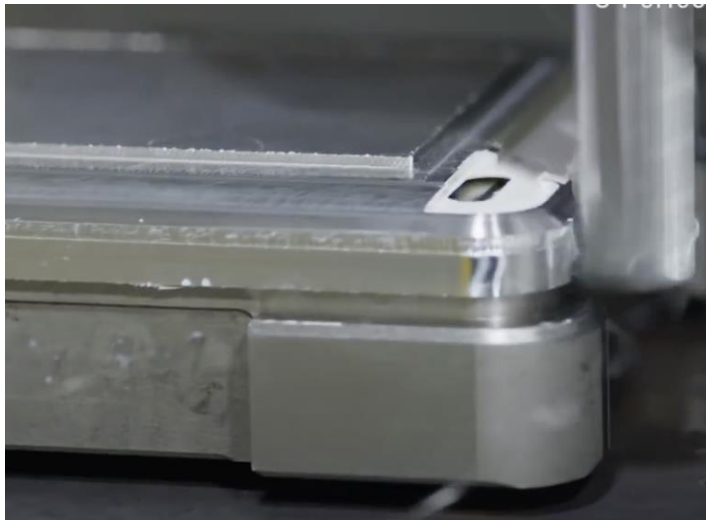
기업용 고성능
3D 프린터 의뢰

제품 Prototype을 만드는 방법 2



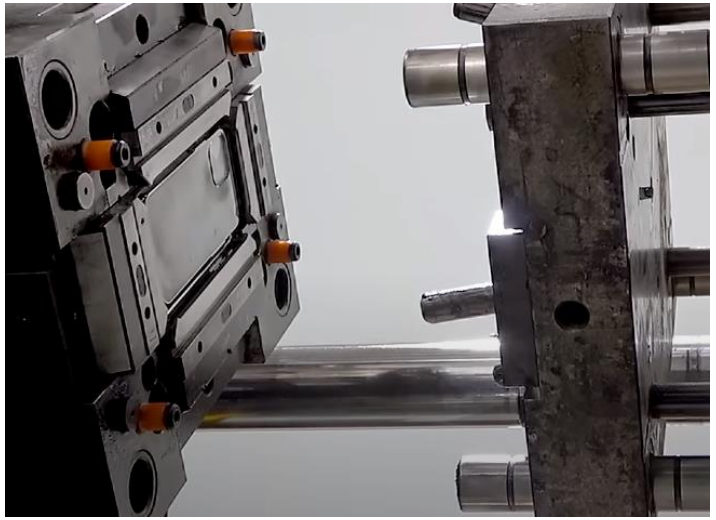
3D 메탈 프린팅

(turbine blade)



CNC가공

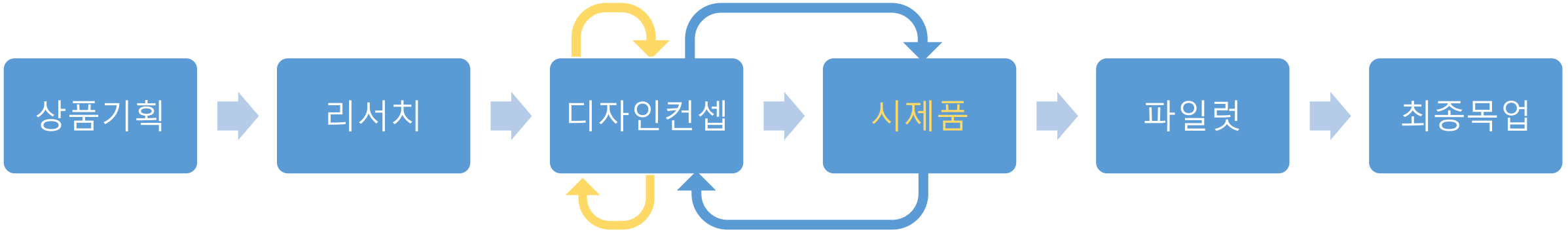
(smart phone AL body)



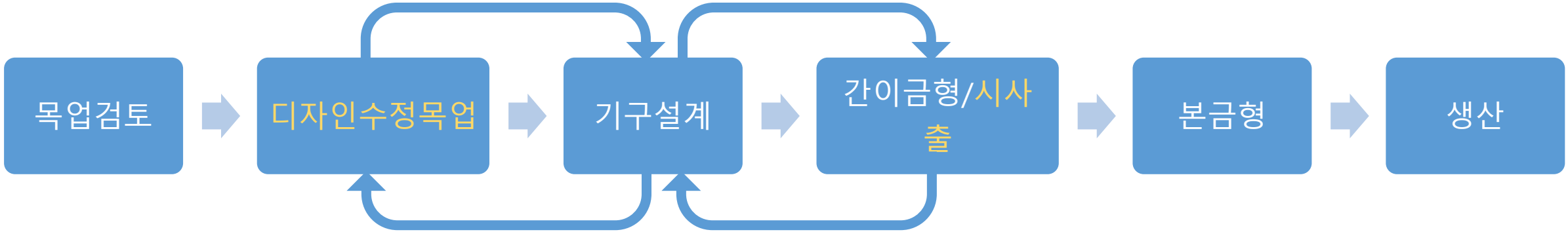
사출성형(with 금형)

(smart phone 케이스)

제품 디자인/개발 프로세스 (플라스틱제품)



Design 프로세스 (디자인부서)



제품개발 프로세스 (개발부서)

“3D 프린터” 란? (2D프린터와 비교)

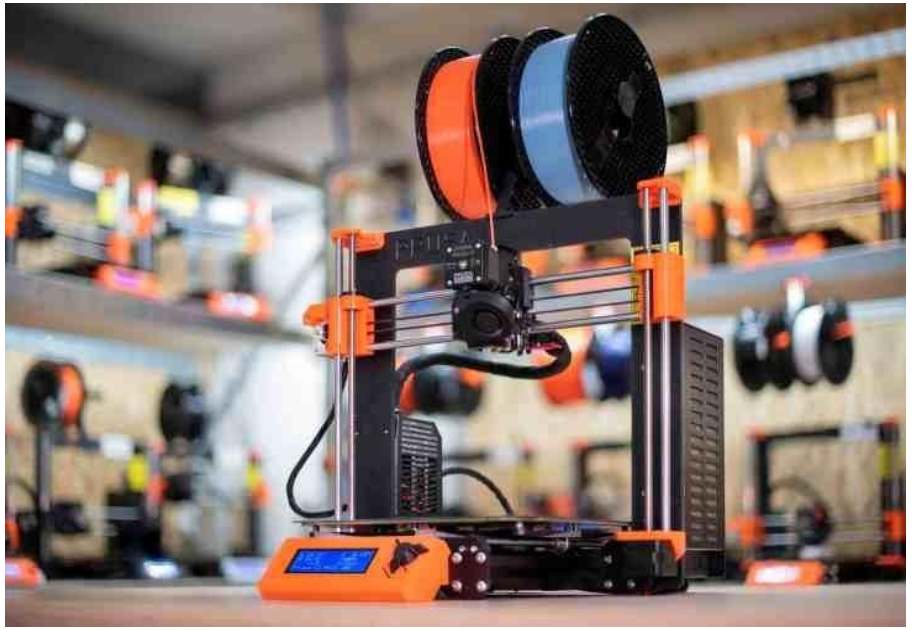
컨텐츠 : 문서 / 인터넷

소프트웨어 : 워드 / 프린트설정

재료 : 종이

소모품 : 잉크

출력물 : 인쇄된 종이



컨텐츠 : CAD / 공유사이트

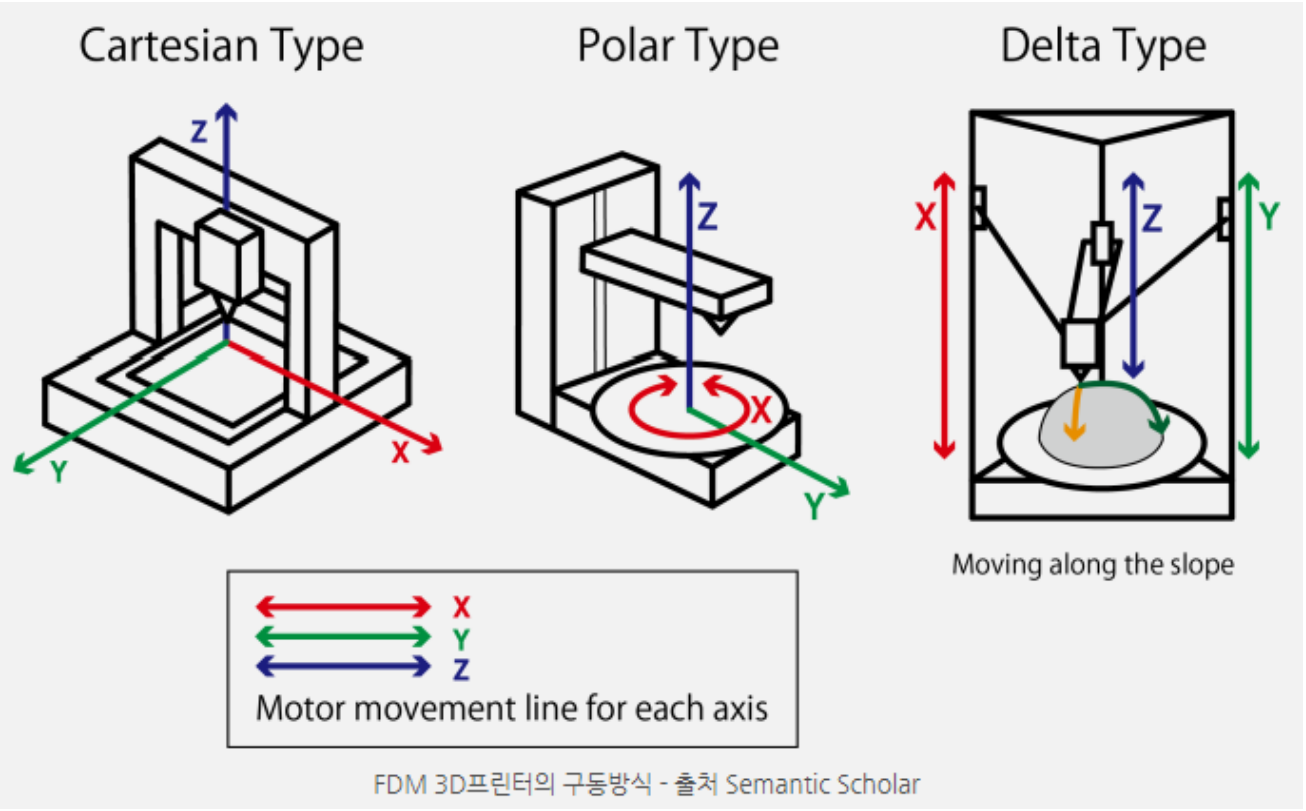
소프트웨어 : 슬라이서 / 출력프로그램

재료 : 필라멘트

소모품 : 노즐, 팬, 필터, 베드

출력물 : CAD 형상

3D 프린터의 종류 및 구동방식

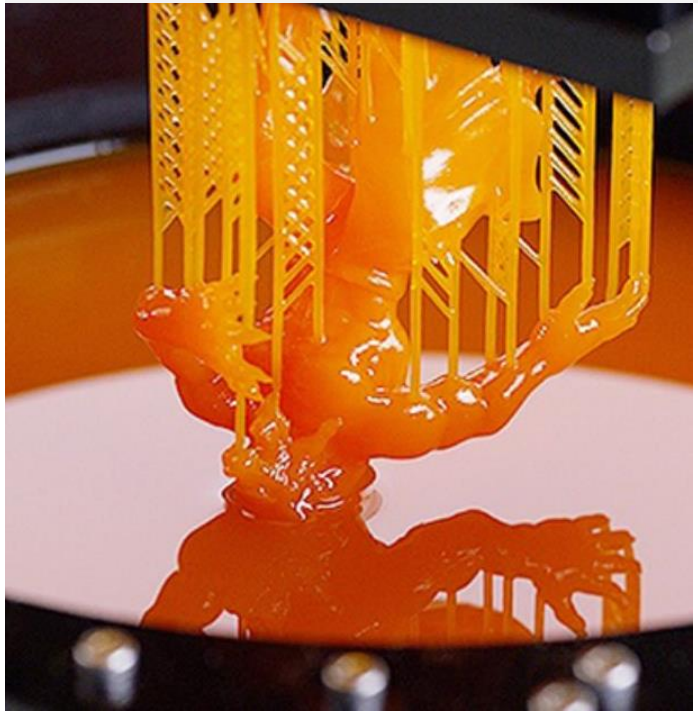


FDM 3D프린터의 구동방식 - 출처 Semantic Scholar

FDM (Fused Deposition Modeling)

열가소성수지를 재료(필라멘트 형상)로 적층하여 완성

Z축 구동 + Laser(광학적 X,Y)

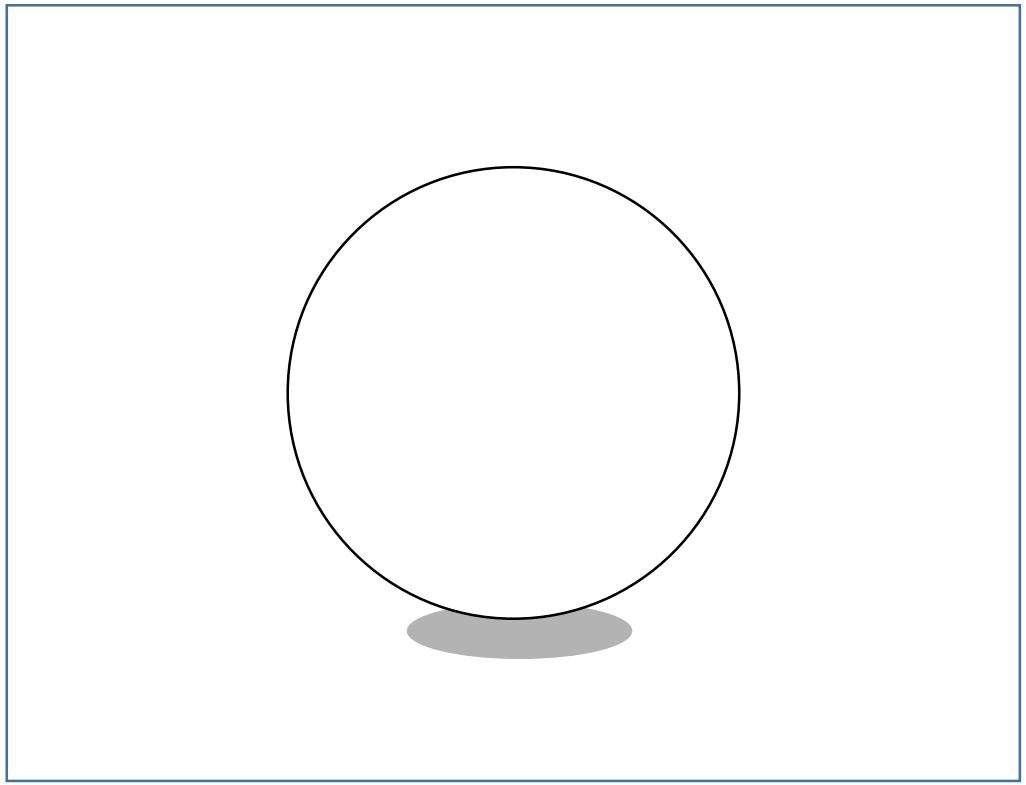


SLA (Selective Laser Sintering)

DLP (Digital Light Processing)

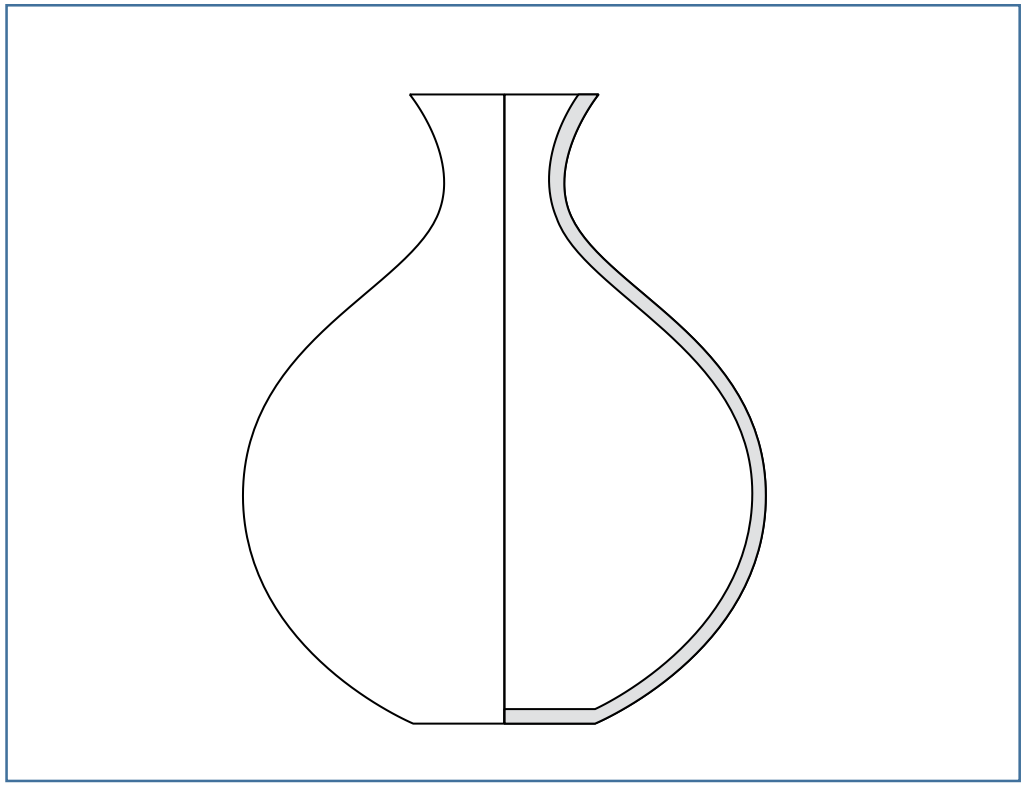
SLS (Selective Laser Sintering)

3D 프린팅의 원리(1)



종이로 입체구슬 만들기

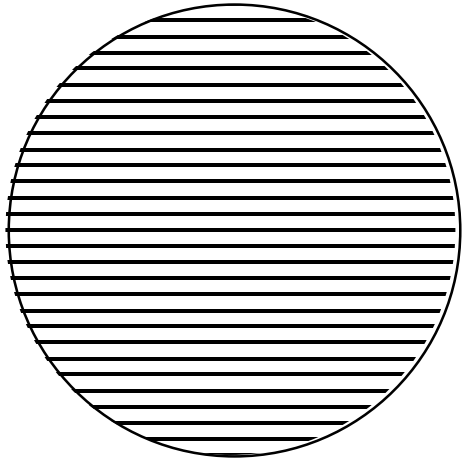
(준비물 : 종이, 컴퍼스, 풀)



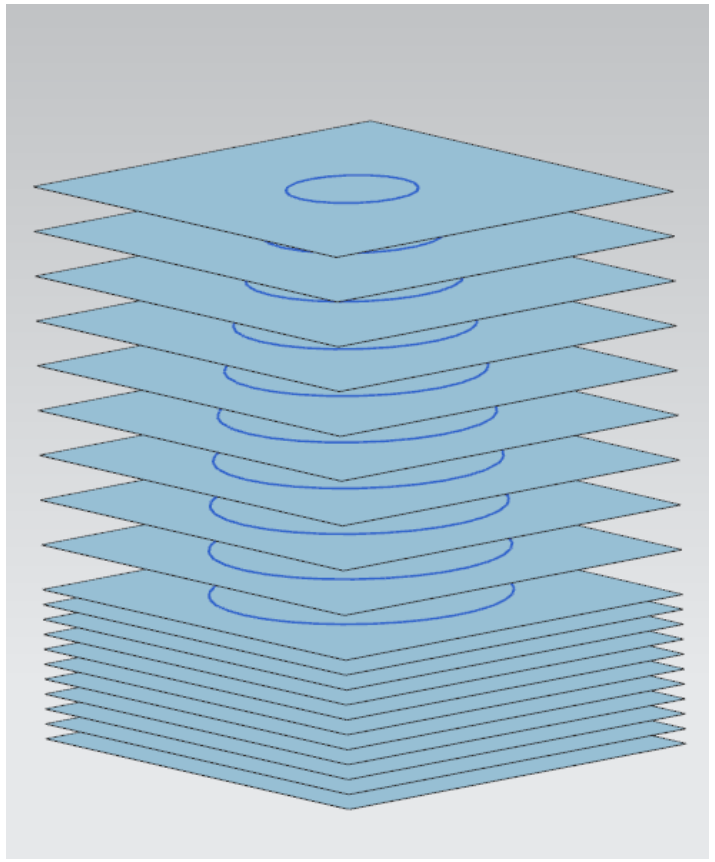
물레없이 화병만들기

(준비물 : 찰흙)

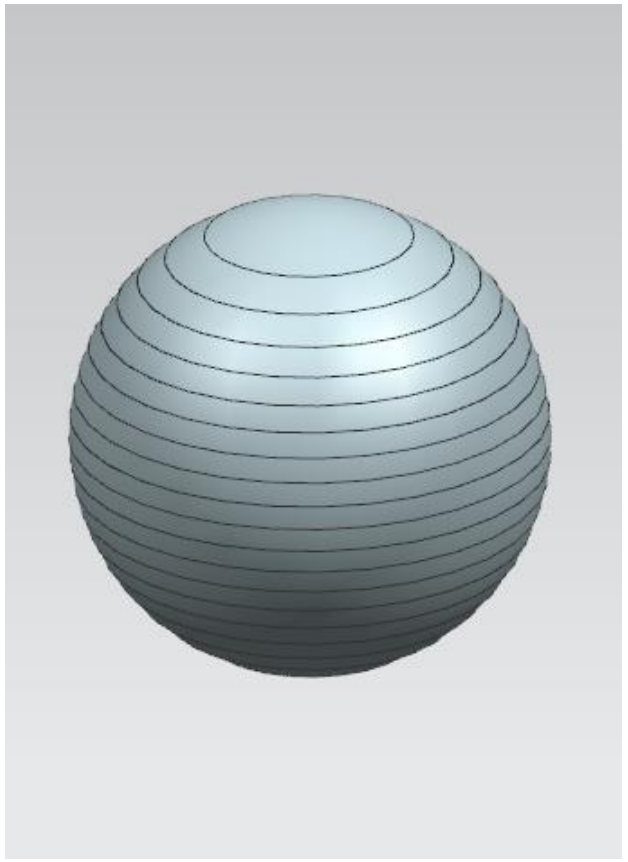
3D프링팅 원리의 이해 / 입체구슬 만들기



원을 그리고 일정한간격으로 슬라이싱한다.



종이위에 슬라이싱 선의 길이를 지름으로 하는 원을 그린다



오려서 순서대로 붙인다.

(계단현상을 줄이려면 도 얇은종이를 사용한다)

3D프링팅 원리의 이해 / 화병 만들기

3D 프린팅의 원리(2)

Full color paper 3d printer

Filament 3D printer

3D 출력물 자체를 상품화한 사례

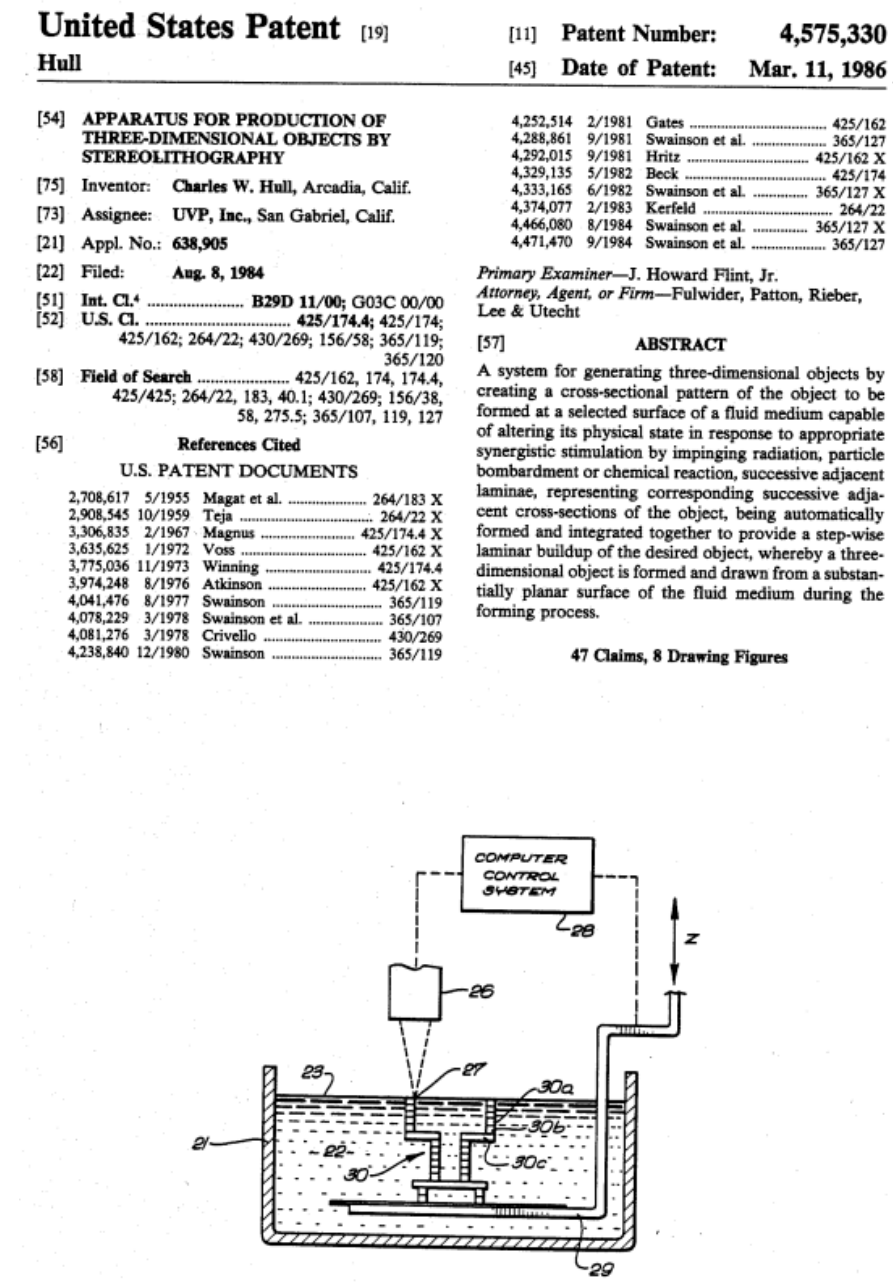
PRUSA

Printing farm

아트토이 DIY

3D프린팅서비스

3D 프린터의 역사



United States Patent [19]
Hull

[11] **Patent Number: 4,575,330**
[45] **Date of Patent: Mar. 11, 1986**

[54] **APPARATUS FOR PRODUCTION OF THREE-DIMENSIONAL OBJECTS BY STEREOLITHOGRAPHY**

[75] Inventor: **Charles W. Hull**, Arcadia, Calif.

[73] Assignee: **UVP, Inc.**, San Gabriel, Calif.

[21] Appl. No.: **638,905**

[22] Filed: **Aug. 8, 1984**

[51] **Int. Cl.**[4] **B29D 11/00**; G03C 00/00

[52] **U.S. Cl.** **425/174.4**; 425/174; 425/162; 264/22; 430/269; 156/58; 365/119; 365/120

[58] **Field of Search** 425/162, 174, 174.4, 425/425; 264/22, 183, 40.1; 430/269; 156/38, 58, 275.5; 365/107, 119, 127

[56] **References Cited**

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Primary Examiner—J. Howard Flint, Jr.
Attorney, Agent, or Firm—Fulwider, Patton, Rieber, Lee & Utecht

[57] **ABSTRACT**

A system for generating three-dimensional objects by creating a cross-sectional pattern of the object to be formed at a selected surface of a fluid medium capable of altering its physical state in response to appropriate synergistic stimulation by impinging radiation, particle bombardment or chemical reaction, successive adjacent laminae, representing corresponding successive adjacent cross-sections of the object, being automatically formed and integrated together to provide a step-wise laminar buildup of the desired object, whereby a three-dimensional object is formed and drawn from a substantially planar surface of the fluid medium during the forming process.

47 Claims, 8 Drawing Figures

1986 년 SLA방식의 특허출원 (액상 광경화 플라스틱연구)

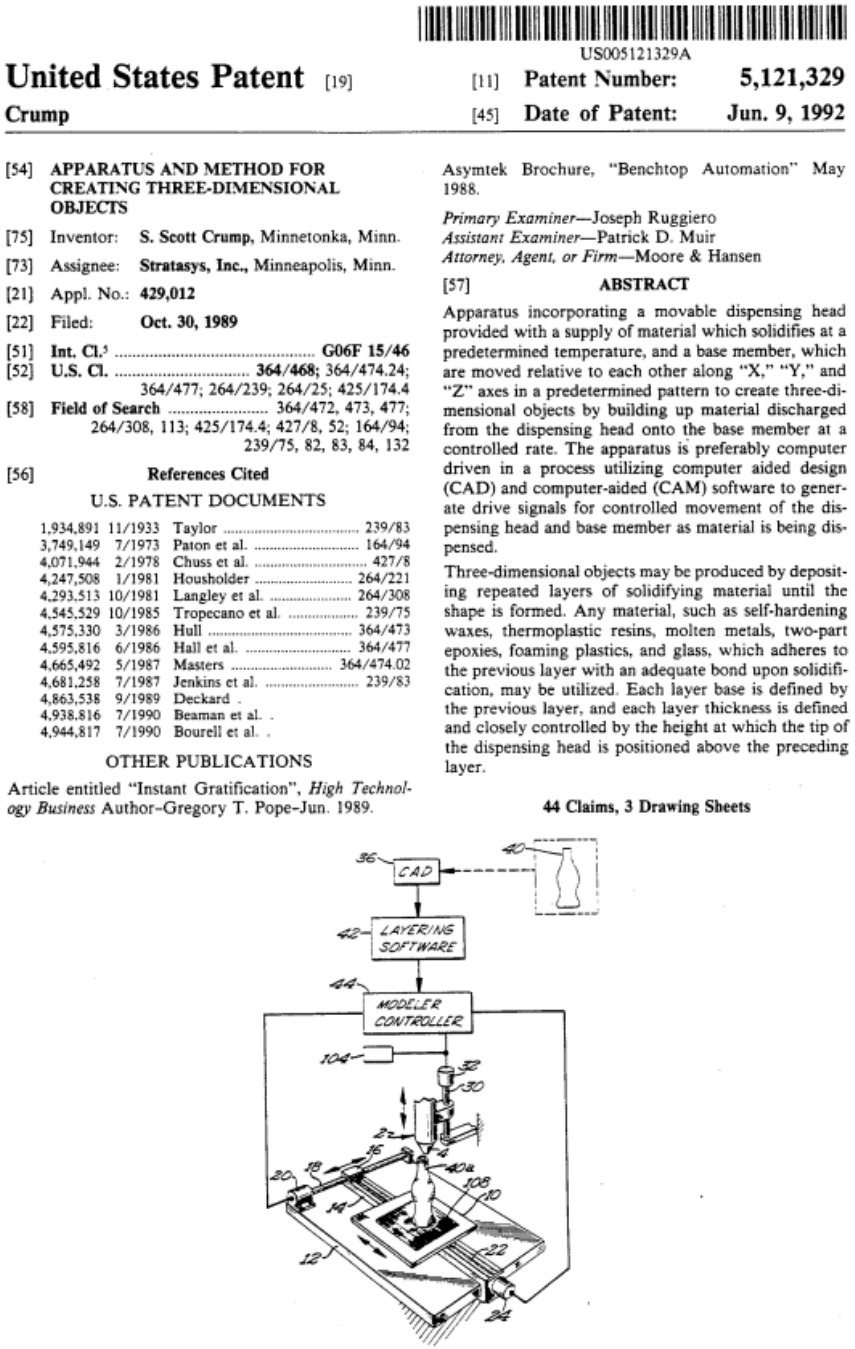
출원자 : Charles W. Hull → 3D systems 설립

stereolithography 출처: 위키낱말사전

[Noun] a means of rapid prototypeprototyping in which a laser hardens successive layers of a photopolymer to create a part with a shape defined by a computer model.

STL 표준파일포멧 개발

3D SYSTEMS



US005121329A

United States Patent [19]
Crump

[11] **Patent Number: 5,121,329**
[45] **Date of Patent: Jun. 9, 1992**

[54] **APPARATUS AND METHOD FOR CREATING THREE-DIMENSIONAL OBJECTS**

[75] Inventor: **S. Scott Crump**, Minnetonka, Minn.

[73] Assignee: **Stratasys, Inc.**, Minneapolis, Minn.

[21] Appl. No.: **429,012**

[22] Filed: **Oct. 30, 1989**

[51] **Int. Cl.**[5] **G06F 15/46**
[52] **U.S. Cl.** **364/468**; 364/474.24; 364/477; 264/239; 264/25; 425/174.4
[58] **Field of Search** 364/472, 473, 477; 264/308, 113; 425/174.4; 427/8, 52; 164/94; 239/75, 82, 83, 84, 132

[56] **References Cited**

U.S. PATENT DOCUMENTS

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4,545,529	10/1985	Tropecano et al.	239/75
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4,595,816	6/1986	Hall et al.	364/477
4,665,492	5/1987	Masters	364/474.02
4,681,258	7/1987	Jenkins et al.	239/83
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Article entitled "Instant Gratification", *High Technology Business* Author-Gregory T. Pope-Jun. 1989.

Asymtek Brochure, "Benchtop Automation" May 1988.

Primary Examiner—Joseph Ruggiero
Assistant Examiner—Patrick D. Muir
Attorney, Agent, or Firm—Moore & Hansen

[57] **ABSTRACT**

Apparatus incorporating a movable dispensing head provided with a supply of material which solidifies at a predetermined temperature, and a base member, which are moved relative to each other along "X," "Y," and "Z" axes in a predetermined pattern to create three-dimensional objects by building up material discharged from the dispensing head onto the base member at a controlled rate. The apparatus is preferably computer driven in a process utilizing computer aided design (CAD) and computer-aided (CAM) software to generate drive signals for controlled movement of the dispensing head and base member as material is being dispensed.

Three-dimensional objects may be produced by depositing repeated layers of solidifying material until the shape is formed. Any material, such as self-hardening waxes, thermoplastic resins, molten metals, two-part epoxies, foaming plastics, and glass, which adheres to the previous layer with an adequate bond upon solidification, may be utilized. Each layer base is defined by the previous layer, and each layer thickness is defined and closely controlled by the height at which the tip of the dispensing head is positioned above the preceding layer.

44 Claims, 3 Drawing Sheets

3D 프린터의 역사

1992 년 FDM방식의 특허출원

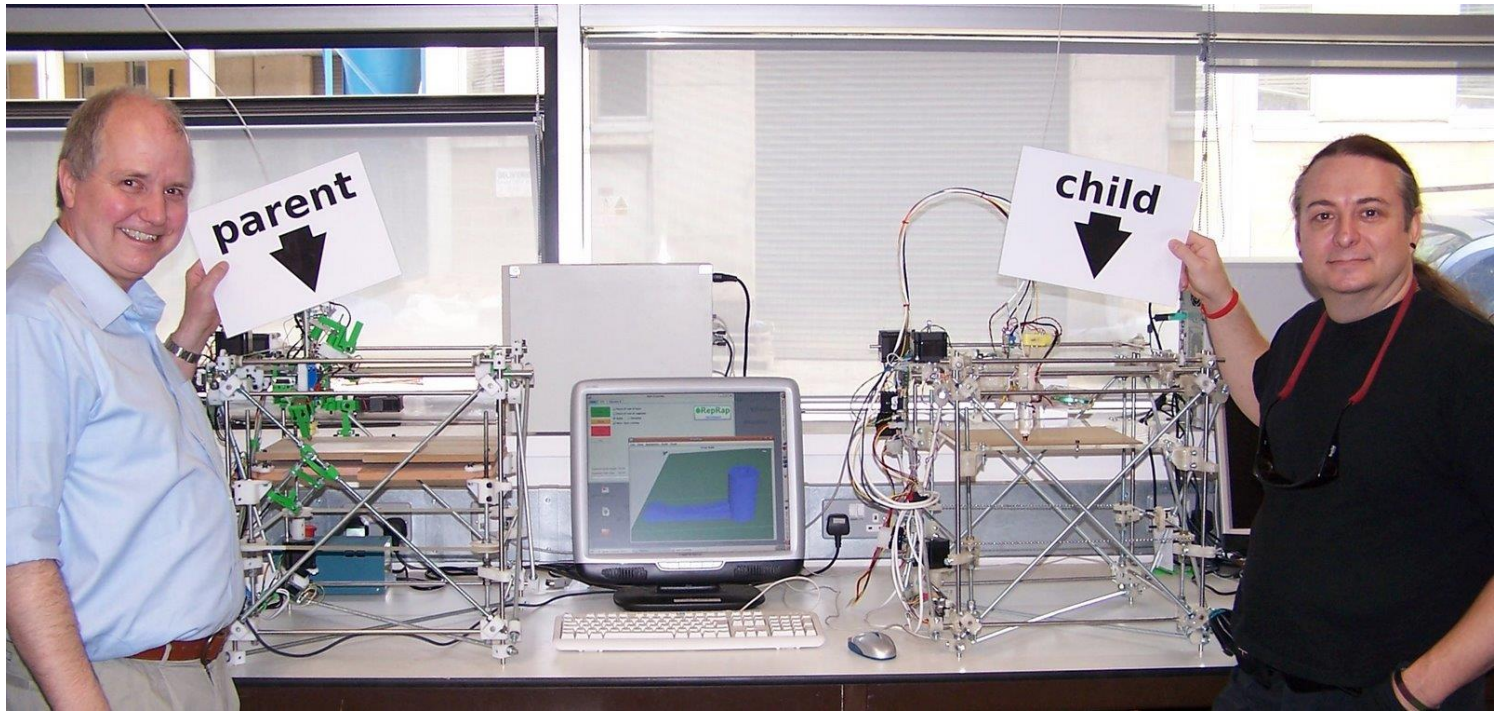
출원자 : S. Scott Crump→ Stratasys 설립

이때 FDM 프린터 출시로 "3D printer"라는 용어가 널리 쓰이게 됨.

stratasys®

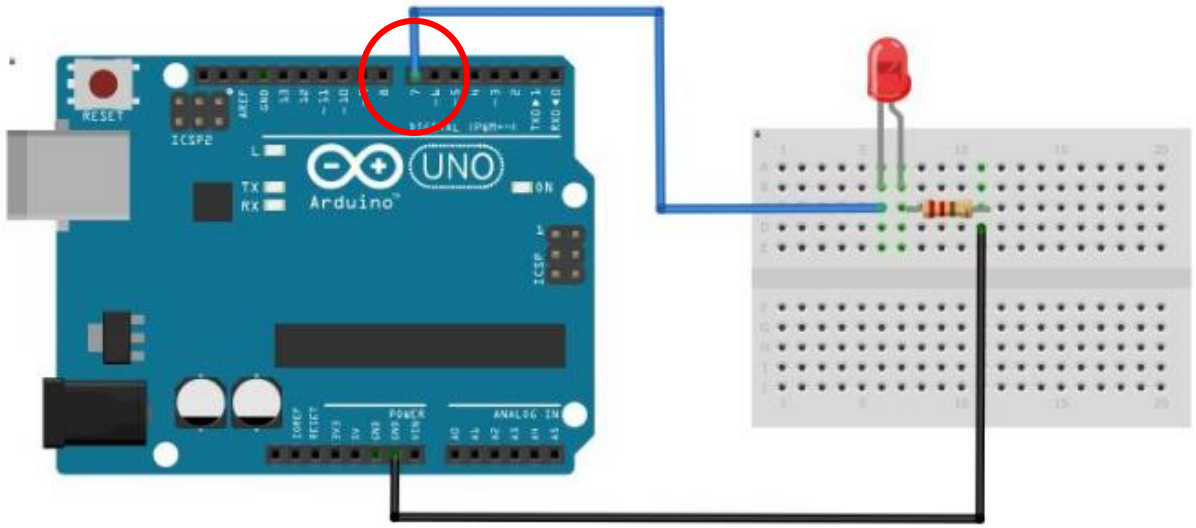
3D 프린터의 역사

3D printer의 대중화 (저렴한 Desk top printer의 출현)



Recommendation
For design prototyping study

제품관련		UX/UI, 제품 관련
3D 모델링 : Fusion 360 Shapr3D (with Pen) (Rhino)	2D 드로잉 : Allustrator Photoshop	하드웨어 : Arduino
렌더링 : Keyshot	3D Character : Blender	프로그램 언어 : C / C++ Python



LED 깜빡임 구현하기

아두이노 프로그램의 구조

```
int number = 0;
```

프로그램에 쓰이는 변수 및 상수 선언

```
void setup() {
  Serial.begin(9600);
  pinMode(13, OUTPUT);
}
```

셋업함수:
프로그램에서 한번만 쓰임

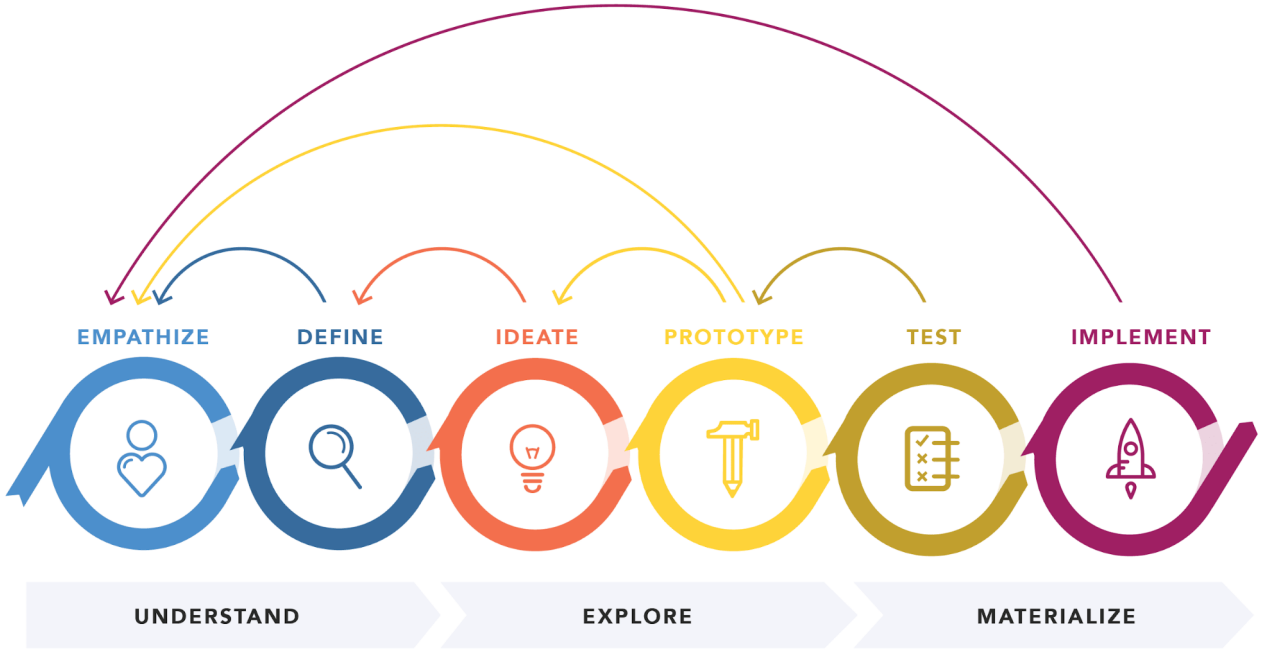
```
void loop() {
  digitalWrite(13, HIGH);
  Serial.print("LED를 ");
  Serial.print(number);
  Serial.println(" 번 켰습니다.");
  delay(1000);

  digitalWrite(13, LOW);
  delay(500);

  number = number + 1;
}
```

메인루프함수:
프로그램에서 계속 반복됨

Design Prototyping (시제품생산)이란?

Design 프로세스 (디자인부서)

전략, 기획(방향,스펙) / 리서치(사용자조사,전문가인터뷰) / 디자인 컨셉 1,2,3 / 시제품제작 / 파일럿테스트 (현장검증) / 디자인 컨셉 수정 1,2 / 파일럿테스트 / **<u>최종워킹목업</u>**(전문업체활용)

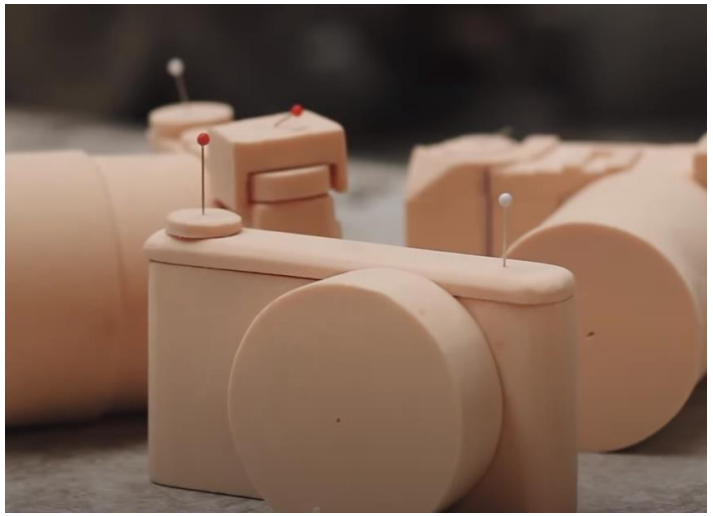


제품 개발 프로세스 (개발부서)

<u>디자인목업</u> 검토 / 디자인수정(스펙,구현성,양산성) / 시제품제작(간이금형) 1,2,3 / 본금형사출 / 신뢰성시험 / 양산금형제작 / 출시

제품 Prototype을 만드는 방법 2

3D 프린팅

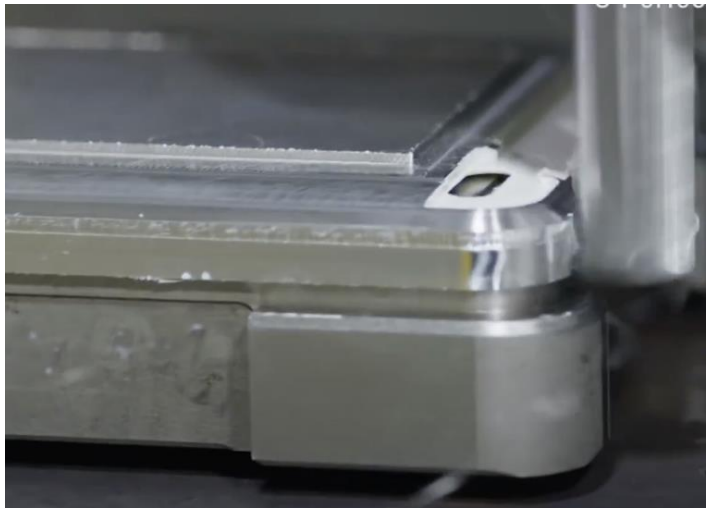


3D 데이터 불필요
빠른 제작속도

저비용(?)
외관 디자인 품평용
저품질(개인차)

CNC가공

(smart phone AL body)

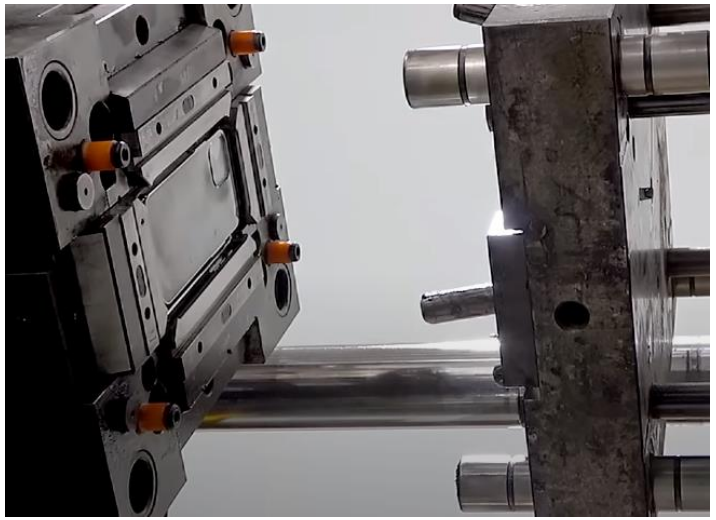


고비용
장비에 따라 형상제한

우수한 정밀도
양산도 가능(다품종소량생산)

사출성형(with 금형)

(smart phone 케이스)



고비용
장비에 따라 형상제한

우수한 정밀도
주로 양산용(소품종대량생산)
플라스틱계열만